

**FORMULATING OF RATIONS CONTAINED DRIED
SUGAR BEET PULP FOR MILKING EWES AND
THEIR LAMBS**

El-Fouly, H.A*.; S.M. Abdel-Baki;M.E. Nowar**
and M.M. Mostafa***

* Biological Applications Department, N.R.C., Atomic Energy Authority.

** Animal production Department, Faculty of Agriculture, Zagazig University.

Accepted 25 / 5 / 2004

ABSTRACT: This experiment was carried out to investigate the effect of partial or complete (50 and 100%) replacement of dietary corn by dried sugar beet pulp(DSBP) on milk yield of ewes and average daily gain of suckling lambs during suckling period. In this experiment, fifty four late pregnancy local Egyptian ewes were randomly divided to three diets groups (18 in each) and yield of lambs for each group (I control, II 50% DSBP and III 100% DSBP). Three experimental diets were formulated to given to ewes from the beginning of the last month of pregnancy to the end of weaning lambs (14 weeks). The amount of three diets were offered during the last month of pregnancy at the rate of 1 kg/ewe/day and from parturition to weaning their lambs (14 weeks) was at the rate of 1.15 kg/ewe/day. Rice straw was added during the experimental period *ad libitum*. The starter diets were given *ad libitum* to lambs from day 5 until weaning as creep feeding together maternal milk.

The results showed that daily milk yield was slightly increased in ewes given DSBP diets as compared with the control diet. The average daily yield was 448, 495 and 521 g for ewes given control, 50% DSBP and 100% DSBP diets, respectively. The discrepancies were statistically insignificant. This may lead us to conclude that DSBP is a good energy source as corn for milk production if it is not better.

Milk constituents from total solids, ash, fat, protein, lactose, Ca, P and Mg were not significantly altered by replacing dietary corn by DSBP. In similar experiments it has been reported that fat corrected milk was not affected or slightly increased by DSBP incorporation.

Male and female lambs growth rates were followed-up from birth to weaning the lambs. The data illustrates that suckling period extended for 100 days when the lambs reached 24.5 to 28.11 kg body weight by the end of this stage. The averages daily body weight gains of male lambs were 222.8, 240.9 and 229.1 g. The corresponding values for female lambs were 215.6, 223.4 and 200.9 g. with control, 50% and 100% DSBP rations, respectively. Although statistical analysis did not show any significant difference between means due to dietary treatments, the daily gains of lambs given 50% DSBP ration surpassed those given the control or 100% DSBP starters.

Key words : Sugar beet pulp, ewes, lambs, milk yield and growth.

INTRODUCTION

In Egypt, there is a serious shortage of dietary energy ingredients needed for ruminant feeding. The animal nutrition system depends mainly on the imported grains. However, increasing quantities of sugar beet pulp are now available as a by-product from sugar beet industry. It has been estimated that there are about 135, 623 feddans cultivated annually by sugar beet, producing about 2,888,770 ton of tubers. Dried sugar beet pulp (DSBP) which is left-off after sugar extraction represents about 173,326 ton, the latter contribute to

the national nutrient supply by 155993 ton Dry Matter(DM), 113,150 ton Total Digestible Nutrient (TDN) and 6,708 ton Digestible Crude Protein (DCP) (Agriculture Economics, 2000).

The chemical composition of DSBP was reported to range 83.8 - 92.5% for DM, 9.3 -10.7% for CP, 0.1-2.4% for Ether Extract (EE), 18.4 - 22% for Crude Fiber (CF), 59.3 - 65.7% for Nitrogen Free-Extract (NFE) and 3.2 - 6.7% for ash (Bhattachrya and Sleiman, 1971; Castle, 1972 and El-Badawi 1999).

Sugar beet pulp could be used as a satisfactory source of energy in rations for growing and fattening ruminants (Bhattachary *et al.*, 1975). Mahmoud *et al.* (1998) showed also that DSBP could be incorporated in lambs finishing rations and replace up to 50% of energy sources. Moreover lambs fed on DSBP ration were heavier than those fed the traditional control rations. Mohsen *et al.* (1999) reported that the DSBP could partially replace the traditional concentrate mixture up to 50%. Whereas, Coppock and Wilks (1991) indicated that DSBP can sustain similar microbial crude protein compared with corn despite lower nonferrous carbohydrates concentrations under local conditions. Bhattacharya and Sleiman (1970) reported also that DSBP energy was as well utilized as corn or barley up to 60% in concentrate rations for ruminants. To determine the optimum beet pulp that could replace corn efficiently in high concentrate dairy rations, it seemed important to study further higher beet pulp concentrations.

MATERIALS AND METHODS

This experiment was carried out to investigate the effect of partial or complete (50 and 100%)

replacement of dietary corn by dried sugar beet pulp (DSBP) on milk yield of the ewes and the daily body weight gain of suckling lambs during suckling period.

1. Experimental procedure:

In this experiment, fifty four, late pregnancy, local Egyptian ewes from Experimental Project Farms, Radioisotopes Applications Division, Nuclear Research Center, Atomic Energy Authority at Inshas were used in this research. The ewes were randomly divided to three diets groups (18 in each) and yield of lambs for each group (I control, II 50% DSBP and III 100% DSBP). The three experimental diets were formulated as presented in Table (1). This experiment was extended from the last month of pregnancy to the end of weaning lambs (14 weeks). During the last month of pregnancy, the amount of diets offered at the rate of 1 kg/ewe/day and from parturition until weaning their lambs (14 weeks) at the rate of 1.15 kg/ewe/day and rice straw was *ad libitum* during experimental period.

The second formulas (starter diets) in Table(2) were given *ad libitum* to the lambs from day-5 to weaning time, as creep feeding together maternal milk.

2. Ewes Milk yield and composition:

Milk yield was recorded for every ewe once every two weeks started from the fifth week until 11 weeks of lactation. Twenty four hours before hand milking after the lambs were kept away from their dams. Ewes were completely hand milking until stripping the udder. Representative milk samples of about 50 g/ewe were taken and stored at -20° until analysis.

Milk analysis: The total solids content as well as ash content according to laboratory manual of Ling (1963). The fat percentage was determined by Gerber method for milk according to British standard institution (1951). The protein percentage was determined by the micro kjeldahl distillation method according to ling (1963). Lactose content was calculated by the differences between total solids and the sum of fat, protein, and ash contents.

Total phosphorus content of milk was determined by a calorimetric method based on the principles described by Trough and Meyer (1939). Total calcium and magnesium in milk after digestion were determined by using Atomic Absorption spectrophotometer according to Jackson (1958).

3. Live body Weight and daily body weight gain of lambs:

The lambs were weighted after lambing and weighted weekly until weaning. The average daily gain (ADG) was calculated during this period (from birth to weaning).

4. Statistical Analysis:

Data were subjected to statistical analysis and treatment means were compared by Duncan's multiple range test using MSTAT-C computer program V.2.10 (1988).

RESULTS AND DISCUSSION

The effect of partial (50%) or complete (100%) replacement of dietary corn by DSBP on milk yield and composition of ewes:

Table (3) illustrates the effect of partial or complete replacement of dietary corn by sugar beet pulp on the daily milk yield. Clearly daily milk yield was slightly increased in ewes given DSBP diets as compared with the control diet. The average daily yield was 448, 495 and 521 g for ewes given control, 50% DSBP and 100% DSBP diets, respectively. The discrepancies were statistically insignificant.

This may lead us to conclude that DSBP is a good energy source as corn for milk production if it is not better. Many other investigators found that milk production was not affected by incorporating beet pulp as an energy source in milking cow's diet (Ronning and Bath, 1962 and Beauchemin *et al.*, 1991) Maareck (1997) reported that the average daily milk yield and daily Fat-corrected milk (FCM) (4%) was not affected significantly by incorporating DSBP into the concentrate at the rate of 12.5 and 25% level in the ration of lactating buffaloes.

Others reported that daily milk yield was significantly increased in cows fed concentrate mixtures containing DSBP in comparison with the control ration (Haaksma, 1991, Garnsworthy, 1989 and Lebzien and Engling, 1995). El-Badawi *et al.* (2001) indicated that daily milk yield and milk fat content were significantly increased in cows fed the concentrate mixtures containing 25 and 40% DSBP in comparison with the control ration. They also found that the average daily of 4% FCM was increased by 7.15% and 11.90% and the feed cost per ton was decreased by 13.4% and 16.9% for cows fed the concentrate

mixtures containing 25 or 40% DSBP, respectively. These results are in favor with the findings of Garnsworthy (1989) and Lebzien and Engling (1995) who reported that dairy cows fed DSBP had higher milk fat content in comparison with those fed corn or barley grains rations, (3.64vs. 4.49%). Haaksma (1993) reported that the sugar beet pulp has positive effect on milk production, especially, during the first 8 to 10 weeks of lactation for dairy cows.

A third group of investigators reported reduction in milk yield due to DSBP replacement of dietary grains (Jorgensen and Schultz, 1963 and El-Ashry *et al.*, 2000). It seems that the beneficial effect of including DSBP in ruminant rations is apparent only if the basal ration contains grains rather than fibrous materials.

Table (3) also illustrates that milk constituents from total solids, ash, fat, protein, lactose, Ca, P and Mg were not significantly altered by replacing dietary corn by DSBP. In similar experiments it has been reported that fat corrected milk was not affected or slightly increased by DSBP incorporation.

Clearly the foregoing discussion lead us to include that sugar beet

pulp could be used as a satisfactory source of energy in rations of milking ruminants. Mansfield *et al.* (1994) studied the effect of carbohydrate source (ground corn vs. DSBP) on performance of Holstein cows (during week 4 to 17 week of lactation). Dried sugar beet pulp replaced half of the corn which represented about 15% of dietary DM. Diet DM (as mean of treatments) contained 18% alfalfa pellets, 17.4% alfalfa hay, 17.2% corn silage and 47.1 concentrated mixture. The authors reported that neither milk yield (mean 32.0 kg/d) nor 3.5% Fat-corrected milk were affected by DSBP replacement. Milk solids-not-fat and lactose percentages were also not affected by DSBP supplementation. Milk protein percentage and milk protein yields decreased by 3.7 and 5.28%, respectively, but milk fat percentage increased by 4.7% when beet pulp replaced corn in the diets.

The effect of partial (50%) or complete (100%) replacement of dietary corn by DSBP on lambs performance:

1. Live body weight and daily body weight gain:

Male and female lambs growth rates were followed-up from birth to weaning the lambs. The data

presented in Table (4) illustrates that suckling period extended for 100 days when the lambs reached 24.5 to 28.11 kg body weight by the end of this stage. The average daily gain of body weight of male lambs was 222.8, 240.9 and 229.1 g/h/d whereas, those of female lambs were 215.6, 223.4 and 200.9 g/h/d with control, 50% and 100% DSBP rations, respectively. Although statistical analysis did not show significant differences between means due to dietary treatments, the daily gains of lambs given 50% DSBP ration surpassed those given the control or 100% DSBP starters.

Heavier body weight had been observed with ruminants given concentrated formulas containing DSBP and grains (Bhatlachary and Lubbadh 1971; Bhattachary *et al.*, 1975; Gihad *et al.*, 1989; Mahmoud *et al.*, 1998; Mohsen *et al.*, 1999; Ali *et al.*, 2000 and Saleh *et al.*, 2001). Furthermore, Mandebvu and Galbraith (1999) suggested that any limitations in growth performance of lambs fed a diet containing 100% molassed SBP may be effectively abolished by the replacement with barley at a substitution rate of 25% or more.

Gihad *et al.* (1989) used 18 Ossimi lambs aged 6 months and

were given concentrate feed mixture (CFM) in which 50 or 100% of energy requirements for growth, was replaced by DSBP and supplemented with urea and molasses to prepare isocaloric, isonitrogenous formulas as the CFM diet. They found that the averages daily gain were 95.9, 99.6 and 64.8g respectively. Bhatlachary *et al.* (1975) also reported that the average daily gain of the sheep fed the ground ration containing corn was significantly lower than that of those fed beet pulp or beet pulp plus corn as sole source of energy in their rations. The averages daily gain values were 80, 110 and 130g while feed conversion values were 12.0, 8.8 and 8.1 kg feed/kg gain, respectively. Mahmoud *et al.* (1998) reported that the average daily gain of Barki lambs fed rations containing 17.3 and 34.25% DSBP were higher (162 and 164 g, respectively) than those fed (140g) the control ration which had 0.0% DSBP, but the differences were not significant. Furthermore, the average feed conversion decreased by increasing the proportion of DSBP in the ration.

The foregoing discussion may lead us to conclude that DSBP could be utilized as a satisfactory source of energy for fattening ruminants and could partially or

entirely replace the imported corn in their dietary formulas.

2. Feed intake and feed efficiency:

Table (5) summarizes the effect of DSGP supplementation on the daily dietary intakes and feed efficiencies. During the suckling stage male and female lambs consumed 179.4, 196.0 and 219.0 g/h/d from the tested starter rations plus 448, 495 and 521 g milk/h/d with the control, 50% and 100% DSBP rations, respectively (Table 5). Male and female lambs given the control starter diet (corn based diet) had a better feed efficiency values than those given the 50% or 100% DSBP starters. Feed efficiency values 801 g diet plus 2.0 kg of milk, 813.6 g diet plus 2.05 kg of milk and 959.0 g diet plus 2.27 kg milk for males and 832.1 g diet plus 2.08 kg milk, 877.4 g diet plus 2.22 kg milk and 1094 g diet plus 2.59 kg diet for females given the control, 50% and 100% DSBP diets respectively. Clearly, the less feed efficiency noticed with DSBP supplemented diets could be attributed to their higher daily dietary and milk consumption and to the fact that the lambs, at this stage, did not had a well developed rumen and were unable to digest the cellulolytic carbohydrate of dried sugar-beet pulp.

Similar conclusions have been reported by almost all the investigators who partially replaced grains by DSBP in the rations of fattening sheep. The calculated feed conversion values either as kg DMI/kg gain or as kg TDN/kg gain were significantly improved with the DSBP supplemented diets than those contained only grains (Bhattacharya *et al.*, 1975; Mahmoud *et al.*, 1998; Mandebvu and Galbraith, 1999; Mohsen *et al.*, 1999; Ali *et al.*, 2000; Saleh *et al.*, 2001 and El-Baddawi *et al.*, 2001).

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Table (1): Formation and chemical composition of diets for ewes

Item	Diets		
	Control	50% DSBP	100% DSBP
Ingredient composition %			
Maize grain	42	21	-
Dried sugar beet pulp(DSBP)	-	21	42
Wheat bran	30	30	30
Cotton seed meal	20.8	20.8	20.8
Linseed meal	5.0	5.0	5.0
Dicalcium phosphate	1.0	1.0	1.0
Salts	1.0	1.0	1.0
Trace- minerals*	0.1	0.1	0.1
Vit. AD3E**	0.1	0.1	0.1
Chemical composition			
Dry Matter (%)	89.74	90.38	91.01
Organic Matter(%)	84.50	84.57	84.64
Crude Protein(%)	14.88	15.16	15.44
Crude Fiber (%)	7.52	11.20	14.88
Ether Extract(%)	2.92	2.83	2.67
Gross Energy (k jol/g)	16.67	16.81	16.95

* Each 1 kg contains: 3 g Cu, 30 g iron, 40 g manganese, 45 g zinc, 0.3 g iodine, 0.1 g selenium and 881.6 g CaCO₃.

** Each kg contains: 20.0 M.I.U Vit. A, 2.0 M.I.U Vit. D₃ and 2 g Vit. E.

The analysis of feedstuffs of the experimental diets were carried out according to A.O.A.C.(1980)

Table (2): Ingredient and chemical composition of diets for suckling lambs.

Item	Diets		
	Control	50%DSBP	100%DSBP
Ingredient composition %			
Maize grain	54	27	-
Dried sugar beet pulp (DSBP)	-	27	54
Wheat bran	10	10	10
Decorticated cotton seed meal	16	16	16
Soy bean meal	12.7	12.7	12.7
Linseed meal	5.0	5.0	5.0
Dicalcium phosphate	1.0	1.0	1.0
Salts	1.0	1.0	1.0
Trace -minerals*	0.1	0.1	0.1
Vit. AD3E**	0.1	0.1	0.1
Dried live yeast	0.1	0.1	0.1
Chemical composition			
Dry Matter(%)	89.71	90.63	91.54
Organic Matter(%)	84.61	84.85	85.25
Crude Protein(%)	18.67	19.03	19.38
Crude Fiber(%)	2.96	7.69	12.43
Ether Extract(%)	2.36	2.19	2.00
Gross Energy (k jol/g)	16.91	17.11	17.00

* Each 1 kg contains: 3 g Cu, 30 g iron, 40 g manganese, 45 g zinc, 0.3 g iodine, 0.1 g selenium and 881.6 g CaCO₃.

** Each kg contains: 20.0 M.I.U Vit. A, 2.0 M.I.U Vit. D₃ and 2 g Vit. E.

The analysis of feedstuffs of the experimental diets were carried out according to A.O.A.C.(1980)

Table (3): The effect of partial (50%) or complete (100%) replacement of dietary corn by DSBP on milk yield and composition .

Parameters	Diets		
	Control	50% DSBP	100% DSBP
Overall mean of milk yield(g/h/d)	448	495	521
Total solids (%)	17.18	17.3	17.16
Ash (%)	0.96	0.98	0.97
Milk fat (%)	4.57	4.51	4.25
Milk fat yield (g/h/d)	20.36	22.40	21.89
Milk protein (%)	5.77	6.00	6.29
Milk protein yield (g/h/d)	25.85	29.7	32.77
Milk lactose (%)	6.20	6.00	5.86
Calcium (mg/100 ml)	162.2	146.1	178.5
Phosphorus (mg/100 ml)	108.9	108.9	110.8
Magnesium (mg/100 ml)	14.8	14.5	14.63

Statistically showed insignificant differences between control and the two treatments in milk yield and composition.

Table (4): The effect of partial (50%) or completes (100%) replacement of dietary corn by DSBP on growth rate of lambs

Items	Diets(Suckling stage)					
	Control		50% DSBP		100 DSBP	
	Male	Female	Male	Female	Male	Female
No. of lambs	9	9	9	9	9	9
Suckling period(day)	100	96	100	100	100	105
Birth weight (kg)	3.77	3.79	4.02	4.1	3.98	3.90
Weaning weight (kg)	26.05	24.49	28.11	26.44	26.89	25.00
Total gain (kg)	22.28	20.70	24.09	22.34	22.91	21.05
Daily gain (g)	222.8	215.6	240.9	223.4	229.1	200.9

Table (5): The effect of partial (50%) or complete (100%) replacement of dietary corn by DSBP on feed intake and feed efficiency of lambs

Items	Diets (Suckling stage)					
	Control		50% DSBP		100% DSBP	
	Male	Female	Male	Female	Male	Female
Daily diets intake (g/h)	179.4		196.0		219	
Daily milk intake (g/h)	448.0		495.0		521.0	
Feed efficiency :						
Diets (g/kg gain)	805.2	832.1	813.6	877.4	956	1090
Milk (kg/kg gain)	2.01	2.08	2.05	2.22	2.27	2.59

تكوين علائق تحتوى على تفل بنجر السكر الجاف للنعاج وحملاتها الرضية

حافظ أحمد الفولى*، سليمان محمد عبد الباقي**، مصطفى السيد نوار**

، محمد محمود مصطفى*

* قسم التطبيقات البيولوجية- مركز البحوث النووية- هيئة الطاقة الذرية

** قسم الإنتاج الحيوانى- كلية الزراعة- جامعة الزقازيق

يوجد عجز كبير فى مصادر العلف المتاحة للمجترات فى مصر حيث أن نظم التغذية وتراكيب الأعلاف تعتمد على الذرة كمصدر أساسى للطاقة وحيث أن الإنتاج المحلى لا يكفي الاحتياجات. لذا يتم الاعتماد بشكل رئيسى على الاستيراد ومن هنا تأتي أهمية استخدام مخلفات المحاصيل أو مخلفات التصنيع الزراعى لتغذية المجترات. ويعتبر تفل بنجر السكر من أهم تلك المخلفات وقد استخدم فى تلك الدراسة كبديل للذرة بنسبة ٥٠، ١٠٠% وتزداد أهمية استخدام تفل بنجر السكر نظرا للتوسع الكبير فى زراعة بنجر السكر كبديل لقصب السكر وذلك لما يتميز به البنجر عن قصب السكر فى احتياجه من الماء قليل جدا بالمقارنة بقصب السكر كما أن مدة مكثه فى الأرض قصيرة (٥ - ٦ شهور) بالإضافة إلى تحمله للملوحة بشكل جيد لذا فهو يصلح للزراعة فى أراضي الاستصلاح شمال الدلتا.

وطبقا لإحصائية سنة ٢٠٠٠ فقد تم زراعة ١٣٦ ألف فدان نتج عنها حوالى ١٧٣ ألف طن تفل بنجر جاف (DSBP) تحتوى على ١١٤ ألف طن TDN وحوالى ٧ آلاف طن DCP.

ومن هنا تأتي أهمية استخدام تفل بنجر السكر فى تغذية المجترات هذا بجانب أن سعره أقل كثيرا من سعر الذرة بالإضافة إلى أنه يتحمل التخزين بصورة جيدة حيث لا يصاب بحشرات المخازن والفطريات. وقد استخدم فى هذه الدراسة ٥٤ نعجة محلية (من مشروع المزارع التجريبية- مشروع الأغنام التابع لشعبة تطبيقات النظائر المشعة) فى الشهر الأخير من فترة الحمل حيث قسمت هى وحملاتها إلى ثلاث مجموعات غذائية:

١ - كونترول(مجموعة ضابطة)حيث العليقة تحتوى على ٠ تفل بنجر

٢ - استبدال ٥٠% للذرة بتفل البنجر DSBP

٣ - استبدال ١٠٠% للذرة بتفل البنجر DSBP

لدراسة تأثير هذا الاستبدال على إنتاج اللبن للنعاج وتركيبه الكيميائي وكذلك وزن الحملان ومعدل نموها وكفائتها الغذائية.

وقد استنتج من هذه الدراسة الآتي:

١- إنتاج اللبن يتجه بالزيادة مع المجاميع المغذاة على تغل البنجر سواء بنسبة إحلال ٥٠% أو ١٠٠% مقارنة بالكنترول.

٢- لم يلاحظ أي فروق معنوية في تركيب اللبن (الجوامد الصلبة الكلية - الرماد - البروتين - سكر اللاكتوز - الكالسيوم - الماغنسيوم - الفوسفور) وذلك للثلاث مجموعات.

٣- معدل النمو للحملان خلال مرحلة الرضاعة كان ٨, ٢٢٢, ٩, ٢٤٠, ٢٢٩ جرام للحمل/يوم وذلك بالنسبة للذكور للثلاث مجموعات الغذائية على التوالي: الكنترول، ٥٠% تغل بنجر، ١٠٠% تغل بنجر. أما بالنسبة للإناث فكان معدل النمو ٦, ٢١٥, ٤, ٢٢٣, ٩, ٢٠٠ جرام/يوم وذلك بالنسبة للثلاث مجموعات الغذائية على التوالي.

ويمكن التوصية بالآتي:

١- أنه يمكن إحلال مخلفات بنجر السكر بنجاح كمصدر رئيسي للطاقة وذلك محل الذرة سواء بنسبة ٥٠% أو ١٠٠% وذلك في علائق المجترات سواء لإنتاج اللبن أو النمو وذلك حيث أن استخدام تغل البنجر يؤدي إلى خفض تكلفة تكوين العلائق.

٢- ضرورة الاهتمام بتغذية الأمهات خلال مرحلة الرضاعة وكذلك تغذية الحملان حديثة الميلاد وذلك بتقديم العلائق المتزنة الإضافية لما لذلك من أثر جيد لتحقيق معدلات نمو عالية و أوزان عالية للحملان عند الفطام.